The paintings of Ana Kai Tangata cave, Easter Island (Rapa Nui)

Georgia Lee and Paul Horley

Based on our detailed analysis of the historic photographs and watercolors of Ana Kai Tangata cave, we have made a tentative reconstruction of the entire painted panel as it might have been in the beginning of the 20th century, featuring a larger number of birds. Surprisingly, there are numerous depictions of historic ships – second only to the birdman village of 'Orongo – suggesting that at a certain time in history, the islanders may have considered the European visitors as messengers from the other world, arriving and disappearing to the ocean in a similar seasonal cycle as the migrating birds. This parallel may have been reinforced by the seasonality of ship callings at Easter Island, which occurred with a considerable prominence around the Austral spring and autumn, approximately at the time of the birdman ceremony and half a year after it.

Basados en nuestro análisis detallado de las fotografías históricas y acuarelas de la cueva Ana Kai Tangata, hemos logrado una reconstrucción tentativa de sus pinturas de inicios del siglo 20, las que presentan una gran cantidad de diseños de aves. Lo más sorprendente fue un gran número de barcos históricos pintados – sólo superado por las imágenes en 'Orongo – sugiriendo que durante cierto periodo de la historia los isleños consideraron a los visitantes Europeos como mensajeros del más allá, llegando y desapareciendo en el océano al igual que las aves migratorias. Este paralelo pudo haber sido reforzado con la periodicidad de las primeras visitas a la Isla de Pascua, las cuales ocurrían con una prominencia considerable durante la primavera y el otoño Austral, aproximadamente en la temporada de la ceremonia del hombre-pájaro y medio año más.

Introduction

The rock art of Easter Island is impressive by its quality, variety of motifs and numbers, with about 4000 petroglyphs and pictographs recorded island wide (Lee 1992:4). The largest concentration of rock art on the island is found at 'Orongo, the ceremonial village connected with the birdman competitions, which were of enormous importance in the later period of Rapanui history. In 'Orongo proper, the most prominent petroglyph site is the sacred precinct of Mata Ngarau, with every rock elaborately carved with bas-relief birdman images. Interiors of the dry-laid stone houses at 'Orongo were once richly decorated with paintings of ceremonial oars called *'ao* (a symbol of authority), face masks representing the god Makemake, different types of marine birds, images of sacred birdmen, stylized depictions of female genitalia (*komari*), and numerous depictions of European ships.

Several caves connected with birdman rituals feature bas-relief carvings adorned with paint (Lee 1992:190-192). Many of them are located on the bird islet of Motu Nui and in other caves that are scattered all around the island. A cave close to Hanga Piko Bay has one of the largest painted panels, located within a large cavern called Ana Kai Tangata (Figure 1). Ana Kai Tangata is a large volcanic cave – about 4m tall, 10m wide and 15m deep (Englert 1948:250). Its opening faces towards the sea. At present, the cavern is located above the high tide line and can easily be accessed (Figure 1). The cave floor is covered with irregular boulders. The ceiling dome of the cave has good acoustic properties, so that the cavern could have been used by the ancient Rapanui as a speaking hall or a kind of classroom (Merahi López Atam, pers. comm. 2013). On the other hand, the flat basalt ceiling slabs were a perfect surface for painting. At present, one can distinguish about a dozen birds painted in red and outlined in white. The majority of the birds in the Ana Kai Tangata paintings depict sooty terns, or *Onychoprion fuscatus*, previously known as *Sterna fuscata* (Lavachery 1939:88; Lee 1992:187) – the sacred birds whose first egg of the year was sought in the birdman competition (Métraux 1940:340).

Easy to access, the cavern was visited, described, and documented by several expeditions in the 20th

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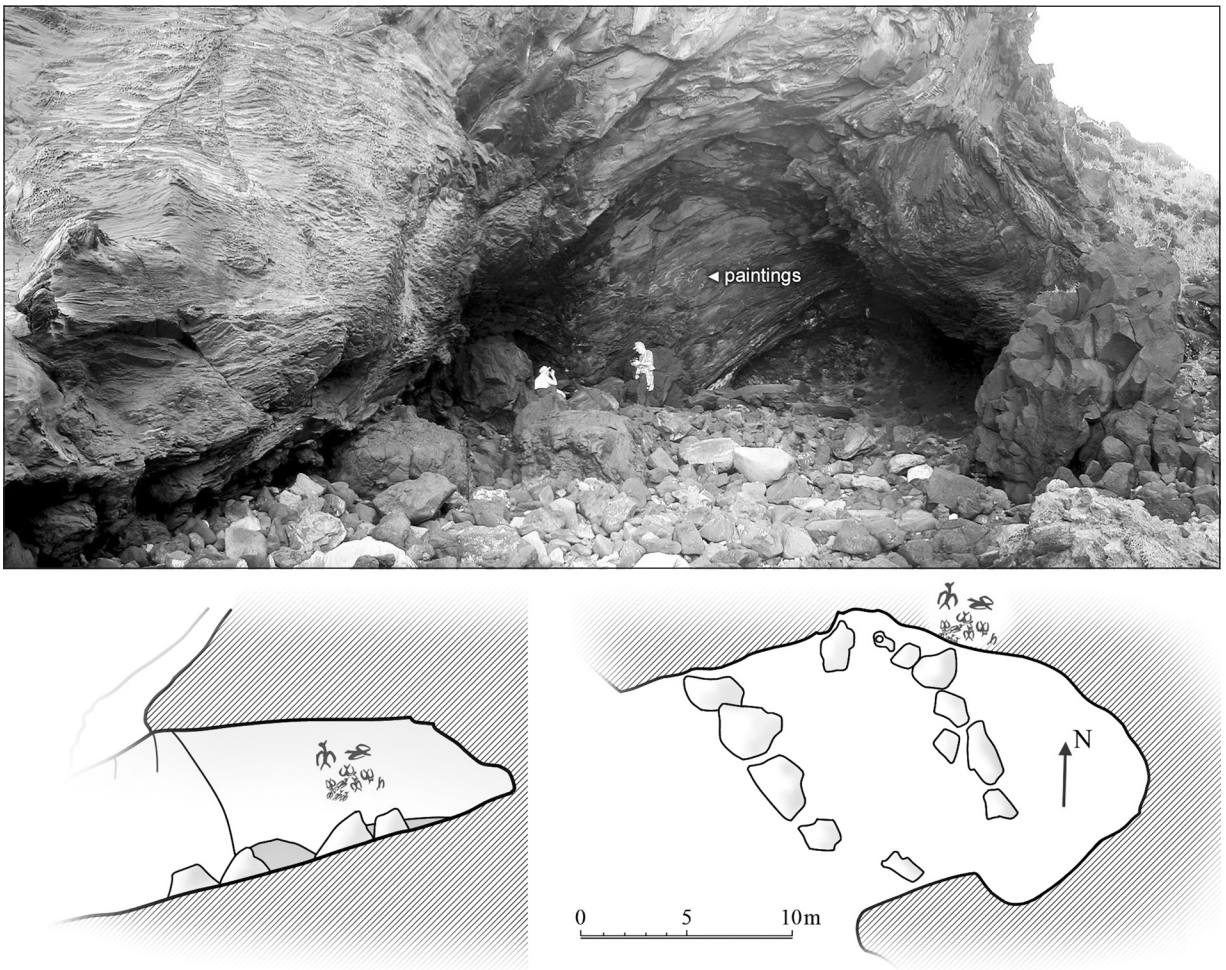

Figure 1. Entrance to the Ana Kai Tangata cave (photograph by P. Horley, 2002). A schematic profile and plan of the cave are provided below the photograph (adopted after Gautier & Carlier 1986:Figure 22).

century, providing numerous reports with many illustrations, suggesting that its paintings were studied and discussed in every small detail. Surprisingly, the reality is distinctly different. The analysis of this archival material in conjunction with a critical re-analysis of published images enhanced with modern digital image processing techniques has provided a wealth of new information about Ana Kai Tangata's paintings.

Documentation of the Paintings

The first – though indirect – mention of the cavern may date back to 1868, when the HMS *Topaze* Expedition with J. Linton Palmer arrived on Easter Island and discovered a classic-style statue semi-buried in one of the houses at 'Orongo (Palmer 1870:177-178):

> "The beautifully-perfect one Hoa-haka-nana-Ia (each image has its own name), now in the British Museum, was found in the stone house called Tau-ra-re-n'ga, at the Terano Kau [Rano Kau, village of 'Orongo] … It was buried waist deep in the ground, and had no crown. Its face, like those of the rest, turned from the sea. It was the only one under cover, although it was reported that there were some in *a cave on the sea-shore. This arose from the misconception of some mural paintings found there*." [emphasis ours]

The first explicit documentation of Ana Kai Tangata, together with the first photographs of its paintings, was published by Alexander Agassiz (1906:62):

> "The shores of Easter Island are riddled with caves. Many of them are quite extensive and have served as habitations to the image carvers. The roofs of the caves are often ornamented with rude painted figures (Pl. 49a), very similar to those found on the slabs covering the stone houses such as have been figured by Thomson … and by Geiseler …. The cave

> from which the pictures on Plate 49a were taken is situated in a small indentation of the coast to the west of Mataveri, south of Hanga Piko landing-place."

It is unclear which other caves ornamented with paintings were visited by Agassiz, yet the photographs of the paintings in Ana Kai Tangata taken by Charles A. Kofoid (Agassiz 1906:Plate 49a, reproduced here in Figure 2) contain much invaluable information.

To understand what one can hope to see in these pictures, it is essential to understand the technology that was available at the time. At the end of the 19th century, and well into the 20th century, photographic cameras used glass plates covered with emulsion that was particularly sensitive to blue, violet, and ultraviolet light. With such biased sensitivity, blue objects were much brighter in pictures than they were in reality. In particular, the exposure time required to achieve proper image density in a landscape picture would overexpose the sky, making it appear snow white and featureless (see the photographs in Routledge 1919, for example). To remedy the situation, photographers resorted to adding hand-painted clouds to their pictures (see photographic plates in Thomson 1891). Low sensitivity for yellow and red hues made the colors appear darker in the pictures compared to those that are perceived by the eye in person. This inaccuracy in tone reproduction was improved by Lumière Panchromatic and Perchromo plates introduced in 1894 and 1902, respectively, offering more uniform sensitivity to the visible spectrum. The innovations, however, took years to gain wide popularity. It should not be forgotten that the development and printing of photographs in those times was done in a dark room with dim red light. The commodity of seeing the process (instead of doing everything by touch in complete darkness) was possible namely because the photographic emulsion had low sensitivity to red light.

As the prevailing color of the Ana Kai Tangata paintings is red, it is natural to expect that these would appear darker in the early 20th-century photography – up to a degree where the paintings may have blended in with the surrounding rock. This effect is illustrated in Figure 4. The red channel of a color photograph (Figure 4b) features much brighter bird bodies in comparison to green and blue channels (Figure 4c, d). The blue channel image gives an impression of how Ana Kai Tangata's paintings would look in old photographs. As one can see, the intensity of the pigment of the bird bodies is considerably darker. Curiously, each color channel highlights different image details. The in-flow of a red pigment blurs the detail of a bird body and wing in a red image (Figure 4b, #1), yet this undesirable effect disappears in other channels. Bird wings marked with #2 and #3 are clearly seen in the red images but would be almost unnoticeable in the green and blue images if they were lacking their thin white outline. Red-on-white pigment bleeding is invisible in the red channel (Figure 4b, #4), but is easy to detect in the other two. The weathered red body of a bird on a white field is better seen in the blue channel (Figure 4d, #5); the weathered red image is more visible in the green (Figure 4d, #6) or red channels (Figure 4b, #7 and #8).

Thus, historic photographs are expected to enhance image contrast between red and white pigments; at the same time, the transition between a red figure and the underlying rock will be hard to distinguish due to almost equal intensity. To circumvent these limitations, it is necessary to use digital image processing to correct the color deficiencies of early photographic technology (Figure 4e-f). The desired effect in this particular case will consist of the amplification of tone differences between the neighboring pixels, which can be achieved by local histogram equalization (Gonzalez & Woods 2008:139) and local contrast enhancement. The results produced by both methods are generally similar; however, the local histogram equalization was superior for differentiating areas corresponding to red pigment, which appears darker than the underlying rock (Figure 4e). The processed images allow positive identification (to a different degree) of all problematic places marked with numbers, even revealing faint outlines of eroded bird heads (Figure 4e, #7 and #8). Inspired by these results, we decided to reproduce here the processed photographs of the Ana Kai Tangata murals, aiming to highlight the outlines of motifs that subsequently succumbed to erosion and weathering.

Perhaps the most influential documentation of the Ana Kai Tangata paintings was made by Katherine Routledge during the *Mana* Expedition, 1914-1915:

> "Naturally the months passed at Mataveri were occupied by the residents in feasting as well as in dancing, and equally naturally the victims were human … Some of these repasts took place in a cave in the sea-cliff near at hand. Here the ocean has made great caverns in a wall of lava, into which the waves surge and break with booming noise and dashing spray. The recess which formed the banqueting-hall is just above high-water mark, and is known as "Ana Kai-tangata" or Eat-man Cave … The roof is adorned with pictures of birds in red and white; one of these birds is drawn over a sketch of a European ship, showing that they are not of very ancient date…" (Routledge 1919:259).

It was this European ship, appearing in Routledge's water color (1919:Figure 102), that has sparked many discussions ever since. Many scholars visiting the cave

Figure 2. Photographs of the Ana Kai Tangata paintings taken by Charles Kofoid in 1905 (images courtesy of Ernst Mayr Library, Museum of Comparative Zoology, Harvard University). The images were digitally enhanced to improve visual contrast.

Figure 3. Routledge's photograph of the Ana Kai Tangata paintings Oc,G.T.1761 (Image copyright the Trustees of the British Museum). The image was digitally enhanced to improve its visual contrast.

were unable to find it, claiming the majority of paintings did not survive. Gradually, the "Routledge ship" became one of many frequently-cited examples of irrecoverable loss of Rapa Nui rock art. Was it really so? The answer to this question can be found in another extraordinary document – the photograph of Ana Kai Tangata taken by Routledge (Figure 3). It was never published, nor does it appear in the catalogue of the lantern slides of the *Mana* Expedition (Love 1984). A brief glance at the picture explains why Routledge opted for publishing a watercolor rather than a photographic image. Due to issues with color sensitivity, the photo was quite dark, with bird designs practically blending with unpainted rock. To make the enhanced version of the image (Figure 3), we subjected the scan of the original lantern slide to multi-step image processing. The local histogram equalization technique was applied with varying sizes of a histogram-estimation window to achieve different levels of contrast enhancement. For a small window size (50×50 pixels), it was possible to reveal subtler intensity transitions between the neighboring pixels, but the resulting image was too "cartoonish" and flat. These shortcomings were less pronounced for large window (150×150 and 200×200 pixels) processing, which was, however, insufficient for enhancing details of the individual designs. To solve these issues, we used the images processed with histogram estimation windows of different sizes, stacking them on top of each other. The resulting picture features acceptable image depth and emphasizes the detail of the individual images scattered over the cave ceiling (Figure 3).

We also reproduce here – for the first time in color – the original Routledge watercolor of Ana Kai Tangata (Figure 5). A comparison of Figures 3 and 5 reveals that the painting includes only a group of motifs appearing in the upper part of the photograph. The "mysterious" ship is depicted in black, which is quite unexpected for a panel painted predominantly with red and white pigments. Turning to the photograph (Figure 3), one can confirm the existence of the ship. However, in contrast to the sharp contours given in watercolor, the ship was extremely faint even back in 1914-1915. This detail makes one wonder if the ship indeed was painted in black. It possibly represents an earlier painting made in red; upon weathering, the motif might appear as a dark shade on the background of surrounding rock. This suggestion seems plausible, because the "Routledge ship" successfully survived until today (Lee 1992:112) and can still be traced as a faint yellowish-red design on the cave's ceiling (Figure 7c).

Routledge clearly had a trained eye for distinguishing half-weathered paintings of a European vessel. Surprisingly, she never mentioned that this ship was actually the poorest ship motif that is visible at Ana Kai Tangata. Looking at the photograph (Figure 3; also see Figure 12 for easier detection of the ship motifs), one can immediately spot another ship to the right of a group of three birds depicted on a white background; another ship outlined in white below it; and yet another ship with white sails located to the left of the boy's head. Turning back to the photographs published by Agassiz in 1906 (Figure 2), one can confirm the existence of all of these ships plus a small masted ship with a thick white outline, painted in the left side of the panel. Another unexpected detail about Routledge's watercolor is that every bird motif with an eye invariably features a black eye. The implication of this point will be discussed in the next section.

The next detailed account about Ana Kai Tangata appears in the books written by the members of the Franco-Belgian Expedition to Easter Island, 1933-1934. Alfred Métraux mentions the cave very briefly in conjunction with 'Orongo paintings:

> "Several paintings at Orongo, copied by Geiseler in 1884 … [had] a favorite motif … of European ships under full sail, indicating that the traditional art was still flourishing at the beginning of the nineteenth century … Birds and ships were also painted on the walls of Ana-kai-tangata but have been destroyed recently. One of these birds has been drawn over the design of a European ship" (Métraux 1940:272 [translation by the authors]).

Henri Lavachery, who focused on the documentation of Easter Island's rock art, penned the following about Ana Kai Tangata's paintings:

> "All [depicted] birds are "manutara" (sterna fuscata) [*sic*], recognizable by their slender beak and a dovetail with two points. The wall of basalt and slate [they painted on] resembles overlapping leaves. The top of the decorated surface, covering the ceiling collapsed in 1933. This is probably the part of which Mrs. Routledge made a sketch because I did not find the figures that she painted again. Among them was the figure of a recognizable two-mast topsail trimmed European ship. The smooth basaltic surface encouraged the painters (all figures were not made by the same hand); without preparation, the figures were traced with red powdered ash, highlighted with lime [-white] and black" (Lavachery 1939:88 [translation by the authors]).

Lavachery also produced a detailed watercolor of Ana Kai Tangata's paintings (Figure 6). Surprisingly, it displays every bird documented in Routledge's watercolor (Figure 5), as well as many others, including a white bird in a red circle – perhaps, a stylized depiction of a hatchling inside the egg. Lavachery did not recognize

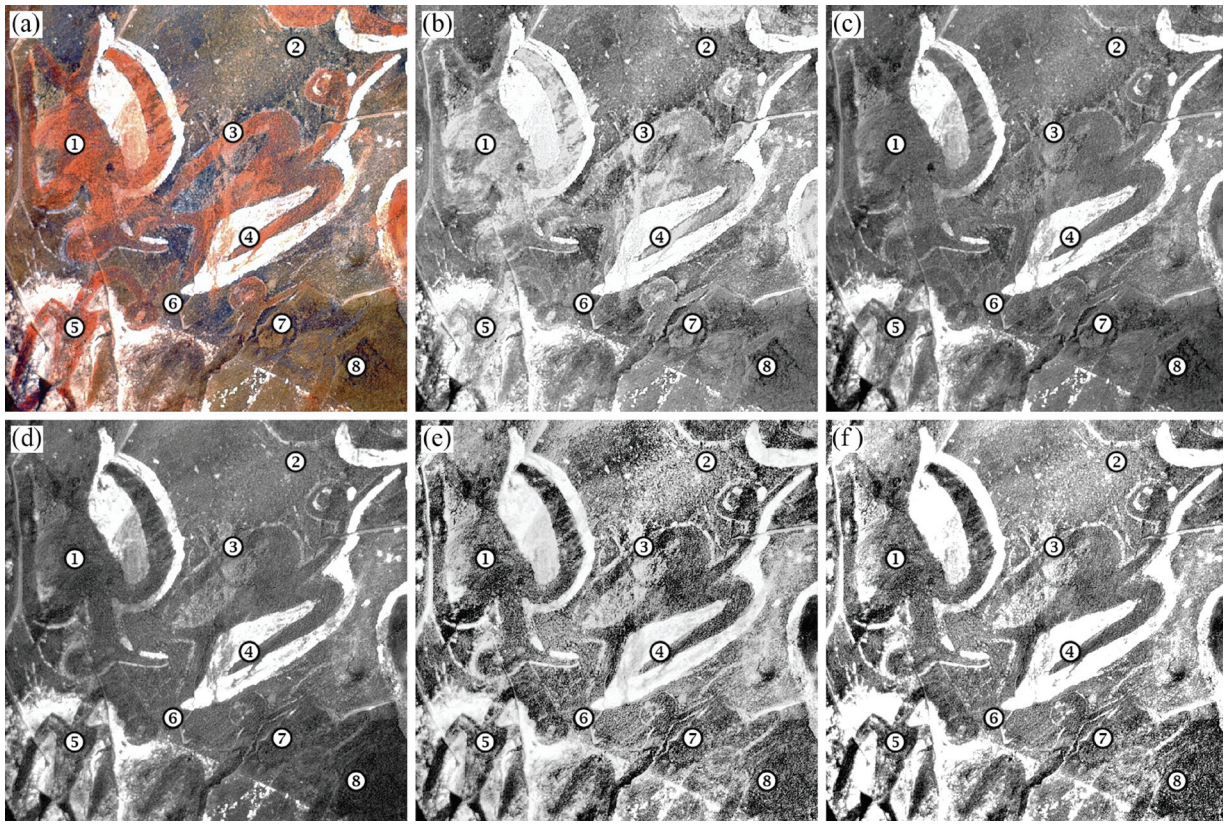

Figure 4. Effect of color sensitivity on the Ana Kai Tangata paintings: a) original image (photo by G. Lee, 1981); b) red channel thereof; c) green channel thereof; d) blue channel thereof. Digital image enhancement: e) local histogram equalization of blue channel image; f) local contrast enhancement of blue channel image. The numbers 1-8 denote image details discussed in the text.

Figure 5. Ana Kai Tangata watercolor by Routledge, 1914-15, WSR-4-17.1 (Image courtesy of the Royal Geographical Society with IBG).

Figure 6. Watercolor by Lavachery showing the Ana Kai Tangata paintings in 1933-34, ET.35.5.355 (Image courtesy of MRAH/KMKG).

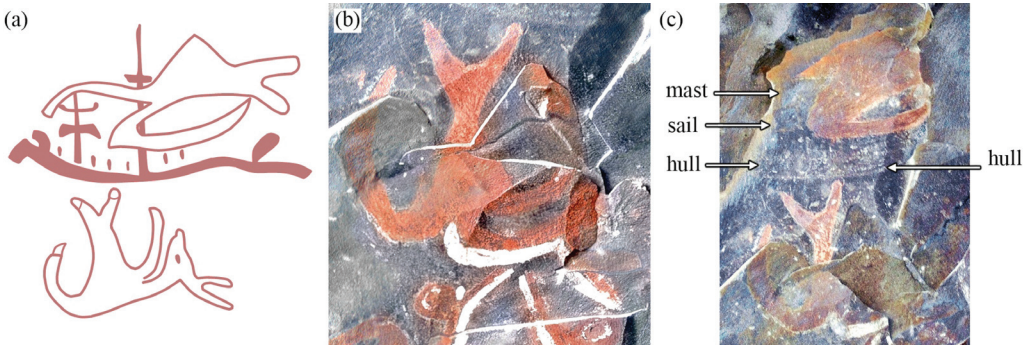

Figure 7. Details of the Ana Kai Tangata paintings: a) "sheep-bird" (adapted after Englert 1948:251); b) a photograph of the corresponding bird image (photo by G. Lee, 1981); c) the same in 2012, with faint traces of "Routledge's ship" above it (photo courtesy of R. Wieczorek 2012, contrast-enhanced).

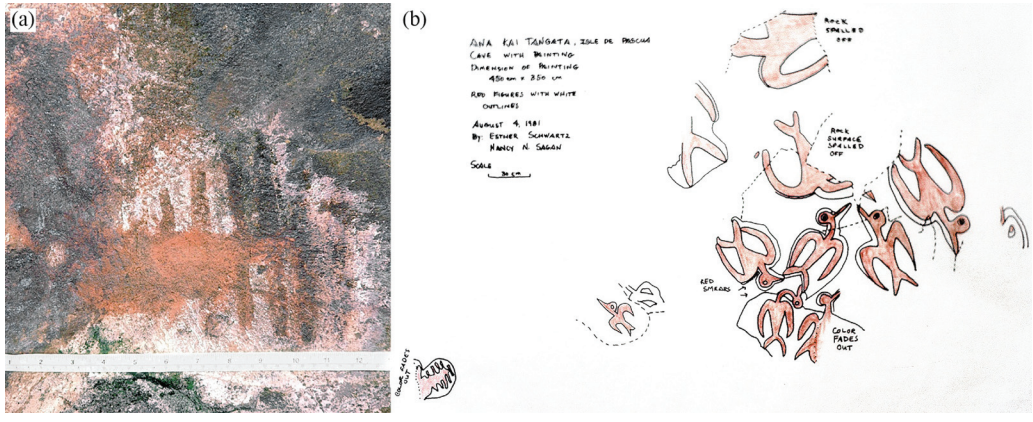

Figure 8. Documentation of Ana Kai Tangata in the framework of the Easter Island Petroglyph Documentation Project: a) an unidentified hatched design (photo courtesy of T. Hoskinson, 1981); b) field sketch of the paintings dated August 4, 1981 (image scan courtesy of the Bancroft Library, Berkeley).

the faint traces of the European ship under the bird in the upper part of the panel, nor any of the other ships in the bottom of the composition. However, he faithfully depicted their hulls as red horizontal bands, providing priceless information about the color of these designs. Only four birds in Lavachery's painting feature black eyes. The three side-by-side birds painted on a white field and an upside-down bird above them are shown with white eyes – exactly as they are in later color photographs. This fact suggests that the black pigment of their pupils weathered away during the two decades separating Routledge's and Lavachery's documentation. Also, a strange design consisting of a thick horizontal band with vertical lines (Figure 6) was still clearly visible in the 1980s (Figure 8a), yet it is difficult to say exactly when it was painted. It falls beyond the frame of Routledge's photograph. Returning to pictures published by Agassiz in 1906 (Figure 2), one finds that the corresponding place had an extra layer of rock with a painting of a white downward-facing bird. Therefore, the hatched design did not belong to the original painting and may be classified as a kind of graffiti.

Father Sebastián Englert dedicated significant attention to Ana Kai Tangata's paintings:

> "In the book of Mrs. Routledge … there is a reproduction of the major figures of these paintings … The most important figure was the European ship with three masts, only two of which were visible. This figure disappeared. As the wall is formed by the thin layers of slate, it is natural that, with a course of time, some slabs will loosen and fall on the floor. This is exactly what happened to that [slab] which had the painting of the ship. Removing the pieces of slates from the [cave] floor, I found some fragments of this figure, but not in the sufficient quantity to reconstruct the painting" (Englert 1948:250 [translation by the authors]).

Our understanding is that the fragments found by Englert most likely belonged to paintings of ships that once adorned the lower part of the wall, because these designs had already fallen in the 1930s (Figure 6). Englert continues his interpretation with a conclusion that gained a considerable popularity in the literature:

> "But there is one figure that represents another object [other than birds] and that allows one to make a conjecture … concerning the origin of these paintings. Below the ship is seen a strange figure that seemingly represents a sheep. It is set upside-down, with the legs towards the keel of the ship. In its head two ears are seen. Additionally it is possible to distinguish, in the reproduction made by Mrs. Routledge, the hooves that today are not well noticeable because the painting became partially erased. It is true that this figure had a certain similarity to that of a bird because the body is not well-developed as it should be for an ovine animal. But this is perfectly explained; because the ancient natives who, apart from the insects and fishes, did not know other animals except for birds, have given to the sheep, seeing them for the first time, the name "manu va'e ehá", "birds with four legs". This representation of a sheep allows one to conjecture with significant sureness that the paintings of Ana Kai Taŋata were made just after the visit of the French admiral La Pérouse, probably in the same year 1786; because La Pérouse was the first European who brought the sheep and goats and gave them as gifts to different natives" (Englert 1948:250-252 [translation by the authors]).

The tracing of Englert's "sheep-bird" is shown in Figure 7a. Direct comparison with Routledge's watercolor (Figure 5) shows that this particular bird is smudged, resulting in the distorted shape of the creature's head. It is actually quite strange that Englert relied so heavily on a watercolor published by Routledge rather than on study of the original, which was in very good shape during that time – we know this because this bird survived intact for several decades (Figure 7b), losing its head to exfoliation only in the second half of 1981 (Figures 7c and 8b). The photograph (Figure 7b) clearly shows that the motif was properly shown in historical watercolors (Figures 5 and 6). In Routledge's picture, a small exfoliated piece at the bird's head was incorrectly interpreted as an open beak, which became the sheep's ears in Englert's drawing. Lavachery depicted this part better, showing a bird with a rounded head and a sharp beak underlined in white. An analysis of the photograph (Figure 7b) also reveals that a hoof-like structure reported by Englert on the bird's wing actually marks a division between rock slabs; however, the contour of the wing goes smoothly from one slab to another, which is different from Englert's drawing (Figure 7a); there is nothing even remotely resembling the "hooves" on the bird's tail, either. Based on photographs from 1905 (Figure 2), 1914-15 (Figure 3), and 1981 (Figure 7c), we can conclude that this particular bird maintained its original outline since the beginning of the century (except for the parts lost in exfoliation), always being the image of a bird and *not* that of a sheep. To vindicate Englert, one should say that his (and Routledge's) impression about the comparatively recent nature of the painting was correct, judging from numerous historical ships depicted under the bird motifs of Ana Kai Tangata.

The scholars of the Norwegian Archaeological Expedition (1955-1956) also maintained the opinion that the Ana Kai Tangata paintings were irreversibly damaged:

> "Routledge … figures a few of the painted Orongo slabs, and reports for the first time on the existence of roof paintings in Ana-kai-tangata, or the 'Cannibal cave' … The motifs are dominated by frigate-birds, and one unidentifiable bird is superimposed on a peculiar sailing craft. Only a couple of birds and some unidentifiable geometrical figures were visible during our visit, the rest had fallen down, either through erosion of the slated roof formation, or through the activities of modern visitors" (Heyerdahl 1961:478).

It is extraordinary that so many researchers (who otherwise produced excellent and reliable observations about Easter Island sites) were convinced that the Ana Kai Tangata paintings were damaged beyond recognition. Perhaps this effect was due to the conflict between expectation and reality. As Routledge never published her photograph of Ana Kai Tangata, and Kofoid's pictures appeared in a zoological volume (possibly difficult to find at that time), further researchers were expecting to see high-contrast paintings made with a solid layer of red and white colors as it appears in Routledge's watercolor (Figure 5). However, in reality, the designs were fainter, so it was *assumed* that the majority of the paintings were lost to exfoliation.

The Easter Island Rock Art Documentation Project started in 1981 under the direction of Georgia Lee. In the framework of this project, numerous petroglyph sites underwent detailed recording (Lee 1992:24-26), leading to the production of accurate tracings and an extensive database of rock art motifs, which allowed for typological and statistical studies (Lee 1992:28-33). Ana Kai Tangata was carefully recorded as well, producing the field sketch reproduced here in Figure 8b; the photograph of the paintings from 1981 is shown in Figure 9. This documentation dispelled the "myth" about the condition of the paintings:

> "all the birds shown in Routledge's sketch are still at least partially visible today. … Heyerdahl … [and] Métraux … [comment] that these paintings have been "destroyed". It was thus interesting to note that our field sketch made in 1981 nearly duplicates Routledge's drawing from 1914-15. Brush strokes can be seen on the panel, and some of the red pigment is running down over the white areas, turning them a pinkish color" (Lee 1992:187-188).

The observation about "bleeding" of the pigments poses an important question about the materials and binding agent used. Finding the proper answer to these questions is important for understanding the painting process and for conservation measures required to protect the site. The living memory of the islanders linked these mural paintings with mineral pigments produced from "colored earth" and clays:

> "The pigments of the [Ana Kai Tangata] figures, that for such a long time resisted the destructive action of salty air in the vicinity of the sea, had been prepared with colored earth from the Te Pahu mine (region of Vinapú), dissolved in the shark oil" (Englert 1948:252 [translation by the authors]).

The soil of Rapa Nui is rich in multi-colored ochres, some of which indeed can be seen at the beach below Ahu Vinapu (Figure 10). The participants of the Canadian Medical Expedition to Easter Island were told that the paintings of Ana Kai Tangata:

> "were made with coloured clays gathered at Vinapu on the other side of the island and mixed with shark oil to make a workable paint. I collected samples of these clays … [of] thirty-six different colours, red, yellow, orange, green, blues, purples, all gathered within a radius of a hundred feet" (Reid 1965:31).

The Rapanui were dependent on natural pigment resources, but also prepared pigments, sometimes in very large quantities, using different types of plant materials (Mieth et al. 2012:13).

A detailed investigation of the pigments from Ana Kai Tangata, 'Orongo, and Motu Nui caves was made by Heide-Margaret Esen-Baur:

> "Of the total of 53 samples [studied] 5 are from Ana-kai-tangata … The sample LB 473 I is white paint, which was removed from (rock) cracks. A red color sample (LB 473 II) was obtained from the body of a bird. The white color sample LB 473 III comes from the surrounding area of this bird. Another red sample (LB 473 IV) was taken from another bird. In the immediate vicinity of this bird a thin painted slate fragment … [sample LB 473 V?]" (Esen-Baur 1983:280-281 [translation by the authors]).

Esen-Baur's analysis (1983:246) shows that the red pigment was produced from natural ochre, either burnt (LB 437 II) or non-burnt (LB 437 III); it may also have included crystalline quartz schist mixed with yellowish-red iron ochre (LB 437 V). Some samples were porous with virtually no binding, which made them disintegrate in water (LB 437 III and IV). Such pigment diversity perfectly fits Lavachery's (1939:88) observation that the paintings were done by several artists. The pigments with a binding agent were more stable, while non-bound pigments were prone to dissolving in water produced by condensation, filtering and constant ocean spray, resulting in pronounced "bleeding" of red pigment in several places. High moisture in the cave created favorable conditions for the growth of algae (sample LB 437 I) and lichens (sample LB 473 V, Esen-Baur 1983:246).

Figure 9. Paintings of Ana Kai Tangata in 1981 (image by G. Lee, image scan courtesy of the Bancroft Library, Berkeley). The image was digitally enhanced to improve visual contrast.

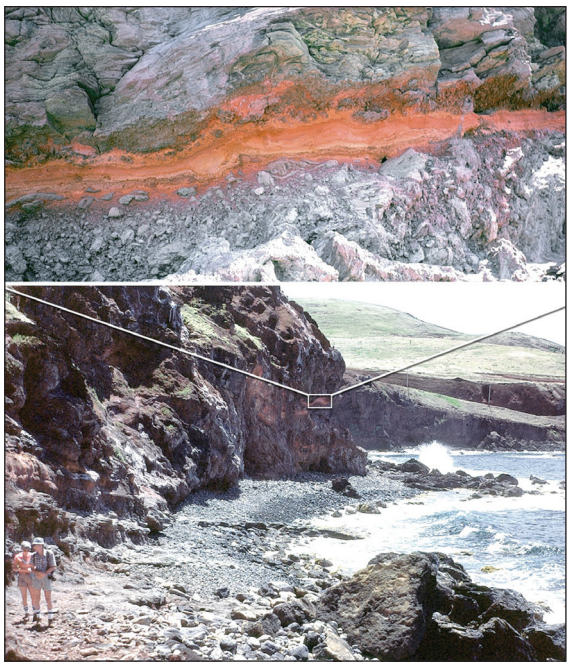

Figure 10. Red ochre vein (top), one of many visible at the cliffs (bottom) at the Vinapu beach (photos by G. Lee, 1982).

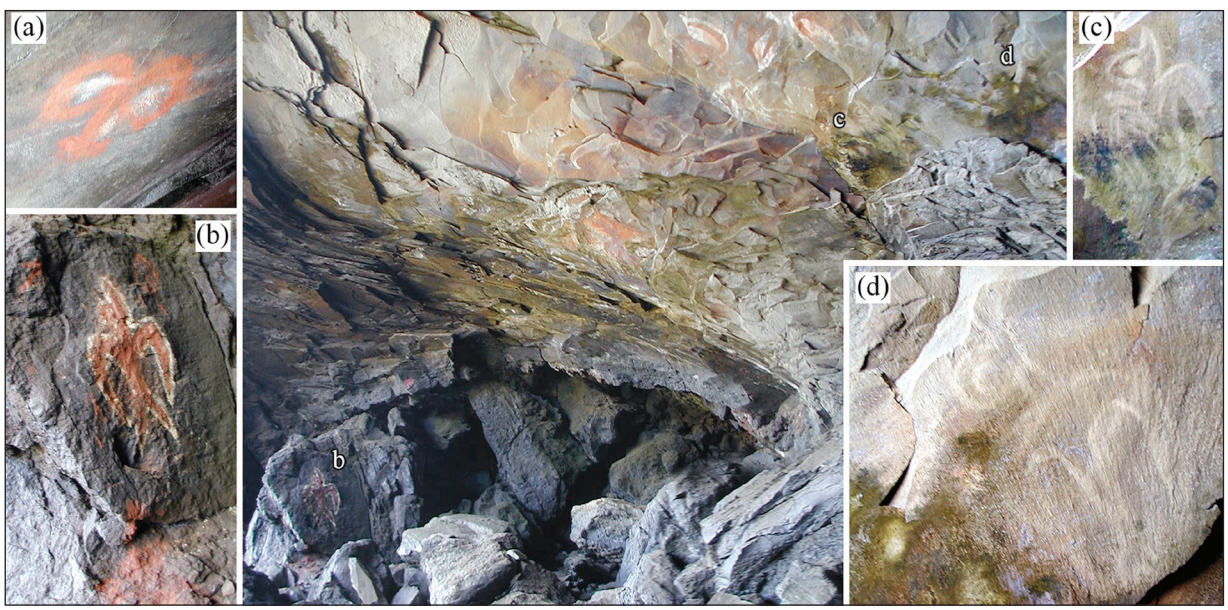

Figure 11. Later additions and graffiti in Ana Kai Tangata (photographs by P. Horley, 2002): a) Makemake face mask painted to the right from the main bird panel; b) red bird (with a *komari* to its upper right) painted on a ground-level boulder; c) bird image scratched under the paintings; d) another bird image scratched over the rock to the right from the main painting panel.

The results of archaeological investigations in Ana Kai Tangata were published by Miguel Cervellino Giannoni (1993:53). He found the oldest occupation layer at a depth of 0.8-1.4m at the back of the cave. This deposit contained obsidian utensils, bone fishhooks, bird bone needles, human bones and teeth, as well as fragments of red, white and yellow pigments. Radiocarbon and obsidian hydration dating of this layer provided a date circa 1660-1700 A.D. The most important finds include a human skull with a Makemake design incised on its front and a triangular fragment of *toromiro* wood found at the depth of 30cm.

Figure 12. Tentative reconstruction of the Ana Kai Tangata paintings based on the photographs produced by Agassiz' and Routledge's expeditions. Colors used follow Routledge's and Lavachery's watercolors. The image shows over 20 bird motifs (marked with letters "a"–"y"), and multiple depictions of marine vessels, including European ships (indicated with numbers 1–8).

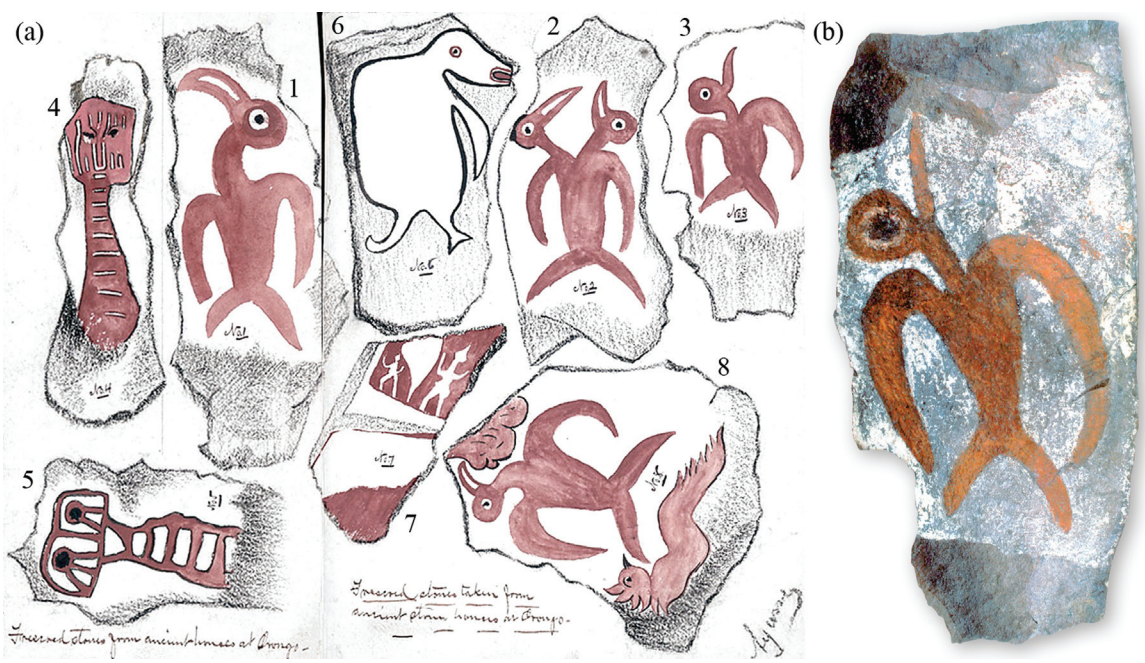

Figure 13. Painted slabs from 'Orongo: a) the picture by A. Ayasse, images NAA8651500 and NAA8651600 (courtesy of the National Anthropological Archives); b) the photograph of the *manutara* slab (No. 3 in Ayasse's image), red channel exaggerated (image courtesy of the Smithsonian Institution; the picture was taken in the 1970s before the artifact was returned to Easter Island and deposited in to the collections of MAPSE).

The wood fragment was exceptional; one of its edges was beveled and another contained a groove, which was indicative of its use in canoe planking. The excavations also revealed a change of islanders' diet (Cervellino Giannoni 1993:53), varying from fish bones at deeper excavation levels to the bones of cows, goats, sheep and pigs found in the upper levels. Concerning the ceiling panel, Cervellino Giannoni (1993:54) comments:

> "The paintings of Ana Kai Tangata are connected with Orongo and adjacent Motu [islets] through their plastic forms, technical characteristics, colors and production period, in accordance with radio carbon 14 and obsidian [hydration] dating (1576 A.D. to 1680 A.D.)" [translation by the authors].

This conclusion, however, leaves the reader somewhat puzzled because Cervellino Giannoni does not say explicitly which excavated artifacts provided these dates; one can only guess that the conjunction was made in reference to paint samples and obsidian utensils found in the lowest excavation layer. However, Cervellino Giannoni (1993:53) says that mineral pigments were found starting from the oldest layer, which also includes the possibility that pigments belonging to the later layers might have been used for painting Ana Kai Tangata birds as well. The scale of the painting industry in the cave is considerable, which is illustrated by a presence of a *taheta* basin cut into one of the boulders (Figure 1, bottom right). One can easily envision that there was a good possibility that this stone basin was used for the preparation and temporary storage of the pigments.

Similar to other Easter Island sites, the paintings of Ana Kai Tangata clearly show changes over time. Some of the paintings were lost to exfoliation, but some motifs – such as the previously mentioned unidentified hatched object (Figure 8a) – were added to the composition. This process has continued into modern times. The presence of scratched names was documented by the Easter Island Rock Art Documentation Project in 1981. Cervellino Giannoni (1993:52) complains about modern designs in black and graffiti added to the panel. Pictures taken in 2002 (Figure 11) also reveal several motifs that never belonged to the original composition. These include a Makemake mask to the right of the main bird panel (Figure 11a), large red *manutara* painted on a vertical rock surface at the ground level (Figure 11b), as well as two sooty tern images scratched over the rock below the bird paintings (Figure 11 c, d). The further evolution of these motifs was studied based on travel images posted on the Internet. The painted *manutara* (Figure 11b) was gone in five years (Akiz 2007). One of the scratched birds (Figure 11c) was faintly visible quite recently (Hecdecard 2011); the larger bird (Figure 10d) disappeared in approximately 2010.

Analysis of Ana Kai Tangata Paintings

Based on historic photographs by Kofoid (Figure 2) and Routledge (Figure 3) and retrieving color data from paintings by Routledge (Figure 5) and Lavachery (Figure 6), we made a tentative reconstruction of the Ana Kai Tangata paintings as they would have been in the beginning of the 20th century (Figure 12). The two main motifs depicted are the birds (marked with letters) and ships (marked with numbers in the figure). All of the birds seemingly represent the sooty tern *manutara* (Lavachery 1939:88; Lee 1992:187) with the only possible deviation of long-necked forms "f" and "r" (Figure 12). However, the painting of a curved neck was seemingly used to avoid motif overlapping, suggesting that bird "f" was painted after *manutara* "k" and "l"; similarly, bird "r" was added after bird "j" was already there.

The temporal sequence of the painting can be extracted from an analysis of the motifs themselves. We are inclined to hypothesize that the earliest birds were painted on the cave ceiling dome, including bird "a" (Figure 12) that was vaguely visible already in 1905 (Figure 2). The use of the cave ceiling seems to be a natural choice to depict soaring birds that are flying over a celestial dome. This decision, however, is more complicated from a technical side. To provide comfortable access to a painting surface located some 4m above the ground, it would have been necessary to construct a large scaffolding, possibly setting it up every time the murals were expanded or re-touched.

The two large birds, "b" and "c", may represent the second production stage that also used the upper part of the ceiling (Figure 12). The neighboring bird "d" may belong to the same group as it is essentially of the same size. Its beak may have been pointing down as suggested by the faint line appearing in Routledge's photo (Figure 3); we used a dotted contour to illustrate our reconstruction of the bird's head (Figure 12d). Birds "b" and "c" are highlighted with an extensive white background almost encircling each motif. A painting of a similar size – bird "h" – uses more elegant highlighting with a refined outline of the bird's neck and beak. This stylistic evolution can be considered as possible evidence suggesting that bird "h" was painted after birds "b" and "c". It is worth noting that Kofoid's pictures (Figure 2) reveal a blank area to the right of this motif, hinting at the existence of an earlier painting – bird "o" (Figure 12). Routledge's picture (Figure 3) shows the traces of a very eroded bird "g" (Figure 12).

It is tempting to hypothesize that the next addition to Ana Kai Tangata's painting were the birds "j"–"m" and "f". They are depicted in the same refined style and are of similar size. They also include new details in the depiction of the eyes (Figure 12). These birds form the central part of Routledge's watercolor (Figure 5) and

remain the most visible part of the Ana Kai Tangata paintings today (Figure 9). The birds "j"–"m" form a kind of zigzag pattern with alternating up-down orientation of the motifs. Birds "k" and "l" are depicted facing each other, forming a triangular arrangement with bird "f". This particular composition may have been expanded shortly afterwards with birds "j" and "m" placed symmetrically with their beaks pointing down, resembling the orientation of bird "f". Bird "n", partially damaged by exfoliation in 1905 (Figure 2), may also belong to the same group. Curiously, birds "j"–"m" have a white 'highlighting field' under both wings – yet the painting on one side is much more faint (Figure 4, d3 and f3) than on the other (Figure 4, d4 and f4). Due to such pronounced differences in intensity, it is natural to expect that the historical images (Figures 2 and 4) will show only the brightest part of the highlighting field. It is tempting to suggest that originally, birds "j"–"m" were painted with a symmetric highlighting field, elaborating the artistic concept of bird motifs "b", "c" and "h". Yet, the initial layer of white painting seemingly featured poor adhesion to the rock and became washed out in a short course of time. To remedy the situation, a new layer of white pigment with a higher concentration of binding agent was applied. However, during this re-touching process, it was decided that a white field should appear under one wing only, producing the designs as we know them today. The new concept of asymmetric highlighting fields has an important iconographic function. For every motif ranging from "j"–"m", it invariably corresponds to the underside of the bird, which is indeed the case of the sooty tern (Figure 14f). On the other hand, this asymmetry creates a kind of three-dimensional effect to the figure. Looking at the surviving part of bird "n", one can hypothesize that it was depicted originally with its underside to the right – that is, back-to-back with bird "m" – which perfectly fits the general alternating pattern observed for bird motifs "j"–"m" (Figure 12).

Three birds, "r"–"t", were seemingly added to the painting later on. These designs are smaller so that the thin white outline (which is faintly visible in the modern photos, Figure 4, c7) was not sufficient to provide the required visual contrast, thus the artist opted to add a large white field for this group of birds. The photograph published by Agassiz in 1906 (Figure 2) shows faint traces of white pigment to the right, suggesting that the highlighting field might have joined the outline of the canoe #3. A faint contour under the discussed group could be the tail of yet another bird "u".

Two smaller birds "p" and "q" were painted further below to the left. These designs appear in both historic photographs (Figures 2 and 3). Lavachery's watercolor (Figure 6) documents that bird "p" was painted red. Presently it is distinguishable mainly due to its thin light-colored outline. White birds "v" and "y" are executed in a less refined style; the former motif was lost to exfoliation by the 1930s, and an unidentified hatched motif was painted in its place (Figure 8a, Figure 6). A darker silhouette in Routledge's photo documents a bird "x", which was painted in red without a white outline (Figure 3). To the left of it, there is an unusual motif depicting a *white* sooty tern inside the red circle outlined in white (Figures 2, 3 and 6). These colors were confirmed by Knoche (1925:Figure 45). It may be that this bird in a circle depicted the magical first egg with a *manutara* chick inside. The design survived at least into the 1950s (Helfritz 1953:Figure 65). At least two birds, "e" and "i", were not painted but incised into the rock.

It is worth a special mention that color photographs of Ana Kai Tangata's designs posed an iconographic problem concerning bird eye depiction in Rapanui art. Numerous bird paintings are known from the houses of 'Orongo Village, including depictions of sooty terns and frigate birds (Horley & Lee 2009:Figure 12). Some of these images were excavated in 1886 by Thomson's surveying crew and illustrated in the expedition reports (Thomson 1891) as Plates 19 and 23, with the former being a photographic image showing two slabs extracted from a stone house and the latter representing an etching of eight painted stone slabs. The choice to publish an etching was certainly imposed by the limitations of printing techniques of the late 19th century regarding the reproduction of color images. Fortunately, the National Anthropological Archives possess the color picture upon which Thomson's Plate 23 was based (Figure 13a). It is the image made by Anton Ayasse in a mixed technique – the slab background and dark outlines are drawn in charcoal, while the red hues are reproduced with watercolor. This picture, published here in color for the first time, gives us a unique glimpse of the 'Orongo paintings in their original colors. To illustrate accuracy and reliability of Ayasse's artwork, we present a photograph of the slab with the *manutara* painting (Figure 13b). Here we would like to analyze the conventions used to depict bird eyes in Easter Island paintings. As one can see from Figure 13, the black pupil was a must for *every* kind of object depicted – birds (slabs Nos. 1-3 and 8), a white animal with a red mouth (slab No. 6), ceremonial oars, *'ao* (slabs No. 4 and 5) and even a strange creature (slab No. 8 below the bird image) looking like a hybrid of a displaying bird and an eel(?). The photograph of the sooty tern slab (Figure 13b) confirms the presence of a clearly-defined black pupil separated from a red-colored body with a thin white ring. However, Ana Kai Tangata paintings seemingly did not obey this convention, showing *red* eyes outlined with white (Figures 4a, 7b and 9). The watercolors made by Routledge and Lavachery show that the birds of Ana Kai Tangata originally had black

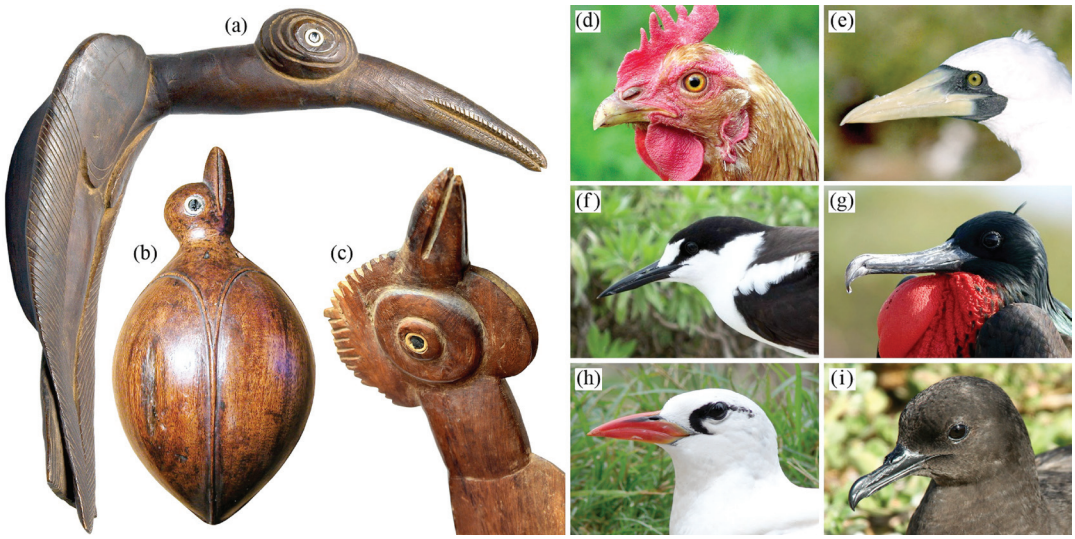

Figure 14. Iconographic analysis of bird images in Rapanui art: a) marine bird figurine VO-22866 (image courtesy of Museum für Völkerkunde, Vienna); b) sooty tern *tahonga* P012 (image courtesy of M. Orliac and the Congregation of the Sacred Hearts of Jesus and Mary, Rome); c) chicken *reimiro* B3642 (image courtesy of Bernice P. Bishop Museum, Honolulu); d) chicken (*Gallus gallus*) (image courtesy of F. Malijković); e) masked booby (*Sula dactylatra*) (image courtesy of D. Wright); f) sooty tern (*Onychoprion fuscatus*) (image courtesy of Wikipedia user Tribalninja); g) great frigate bird (*Fregata minor*) (image courtesy of Wikipedia user Charlesjsharp); h) red-tail tropicbird (*Phaeton rubricauda*) (image courtesy of F. & K. Starr); i) Christmas shearwater (*Puffinus nativitatis*) (image courtesy of D. Wright).

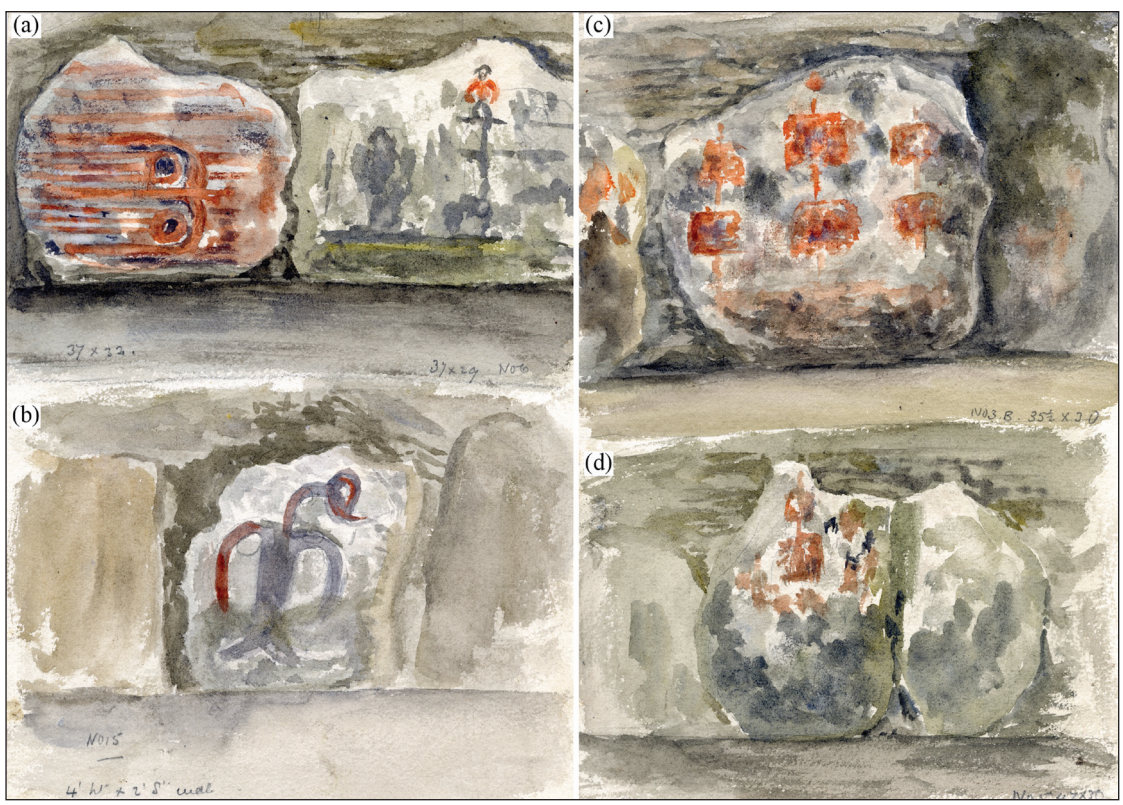

Figure 15. Watercolors by Routledge showing painted slabs inside houses at the birdman village of ‘Orongo, left: WSR-4-17.3, right: WSR-4-17.5 (images courtesy the Royal Geographical Society with IBG): a) stylized ‘ao face and depiction of a European ship in house #R6 (#8); b) stylized bird in the house #R15 (#14); c) European ship in house #R3B (#4); d) European ship in house #R5 (#6). House numbers in parentheses correspond to the enhanced house numbering system used by Ferdon.

Figure 16. Historic ships in the art of Easter Island: a) panel at Ana Hanga Tu'u Hata (photo courtesy of M. Oliver and W. Hyder, 1982); b) *moai* RR-049 at Rano Raraku (excavated by the Norwegian Archaeological Expedition) with a carved ship on its chest (photo by P. Horley, 2002); c) ship painted over toppled *moai* 2-210 forming a part of a crypt at Ahu Vinapu I (photo by G. Lee, 1986); d) European-style rectangular sail scratched over the classical Polynesian canoe at Ahu Nau Nau (photo by G. Lee, 1989); e) earth ship *miro 'o'one* excavated by Charles Love (photograph courtesy of K. Merritt, 2012).

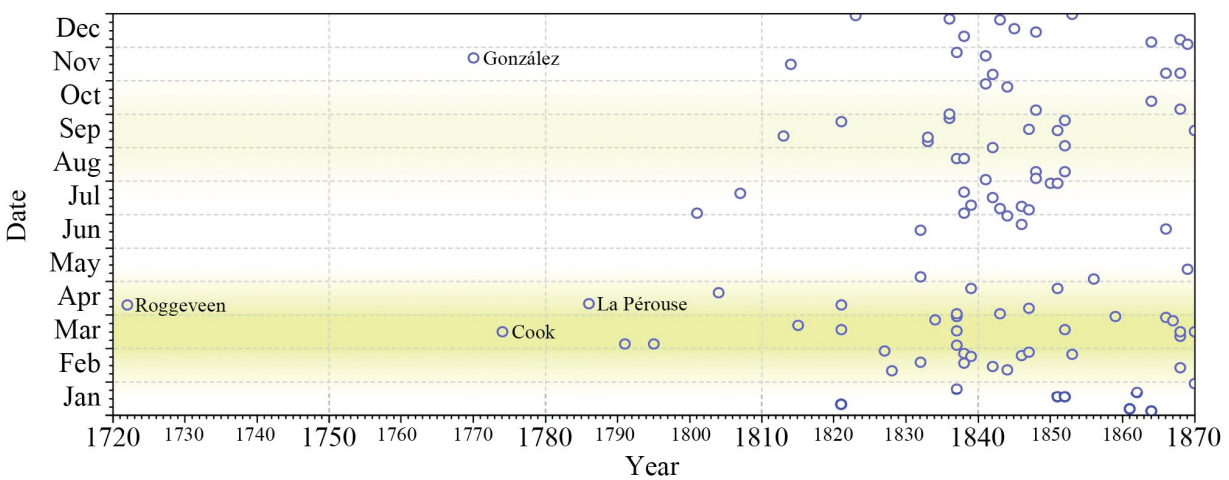

Figure 17. Seasonal distribution of ships calling at Rapa Nui for the period of 1722-1870 (data after McCall 1990:176-199).

pupils as well. Moreover, looking at Agassiz' and Routledge's photographs, it is possible to notice that the eyes of the birds "k", "l", and "m" are definitely darker than their bodies (Figures 2 and 3), providing the photographic record of black bird eyes in full accordance with historical watercolors.

However, the fact that the eyes of the Ana Kai Tangata birds are red today provides an opportunity to reconstruct the painting process. The black pigment was possibly made out of the charred leaves of the *tī* plant (*Cordyline fruticosa*) mixed with a sugar cane juice (Lee 1992:186), which may have had lower adhesion with the substrate in comparison with the red and white pigments mixed with shark liver oil. This would explain why the black pigment did not manage to withstand the actions of the elements nearly as well as the red and white pigments did. In turn, the observed weathering pattern suggests the order in which the pigments were deposited on the rock surface. First, the body of the bird was painted in solid red. The *manutara*'s plumage is black and white (Figure 14f), so the choice of the red color is zoologically incorrect. Yet, it possibly had another function connected with Polynesian cosmogony: "the 'bird of Tane', the sacred red bird called *manukura*, indicates the importance of red feathers in which *mana* was concentrated" (Lee 1992:22). As the sooty tern was the bird producing the first sacred egg overflowing with *mana*, it is easy to envision that its special status – as well as its *mana* – was symbolically depicted by the color red. The white outlines and highlighting fields, when desired, were added around the body. We can conclude that birds were not painted over a prepared white field because *none* of the birds in the modern and historic photographs feature white blotches inside their bodies that would inevitably form when red pigment was washed away. Indeed, for the particular case of the Ana Kai Tangata paintings, the red pigment was less stable, producing considerable pigment "bleeding" over the white fields and surrounding rock (Figure 9). This effect was observed by Esen-Baur (1983:246), who reported that some red pigment samples disintegrated in water. In "terminal" cases, one can see that the entire bird body became washed out, leaving a grayish silhouette of original rock clearly *outlined* with white pigment (Figure 9, Figure 12 birds "m" and "n"). This effect would not occur if the birds were painted over a solid white background.

By tentatively sorting the pigments according to their "binding strength" as white (highest adhesion) – red (prone to be washed away) – black (lowest adhesion), it is possible to reconstruct a credible scenario about the weathering of black eye paintings. For birds "k", "l" and "m", the pupil was painted black over the red bird's body and a later outline by a thin white contour. Birds "f", "r"–"t" (and perhaps "j") were painted in a different way. Neither Kofoid's nor Routledge's photographs show that birds "r"–"t" had eyes (Figures 2 and 3). However, Lavachery's watercolor (Figure 6) – as well as modern photographs (Figures 4 and 9) – illustrate these birds with faint light-colored eyes. Even more surprisingly, the eye spots of birds "r" and "s" are considerably more noticeable than their eroded bodies (Figure 4a). Such a "mysterious appearance" of the eyes in post-1930s images can be reasonably explained by assuming that the white eye-spot was first painted on top of a red-colored body, further to be covered with a black pupil as documented by Routledge (Figure 5). The presence of black pupils would "hide" the eye on historical photographs that were more sensitive to blue light, so that red hues were reproduced considerably darker. However, with black pigment gradually eroding away, the white eye spot will stand out in a more pronounced way (Figure 6). The modern reddish hue of these eye-spots is explained by in-washing of the surrounding red pigment.

At this point, it is beneficial to make a brief deviation focusing on stylistic trends to depict the bird eye with a black pupil surrounded with a white ring (Figure 13). The very same approach was used in Rapanui woodcarving (Figure 14a-c), where a piece of obsidian embedded into fish vertebra conveyed the notion of a pupil and an iris. However, is it zoologically accurate? The answer will be different depending on the bird species. For chickens (Figure 14d) it is true, so that a chicken-shaped *reimiro* (Figure 14c) and a *reimiro* adorned with two chicken heads (Esen-Baur & Forment 1990:215) provide an accurate depiction of bird's eyes. The masked booby also has a notoriously bright iris (Figure 14e), matching the eye of the bird statuette from Vienna (Figure 14a). The general pattern of feathers incised over the statuette's wings makes a strong case in support of the notion that this figure indeed represents a masked booby (Lelièvre et al. 2010:117). Yet the other marine birds (Figure 14f-i) known to Easter Island (Jaramillo et al. 2008:13-14), with sooty terns among them, have a very dark iris. Thus, in a strict sense, the depiction of these birds should be devoid of a white eye outline. Yet, the beautiful examples in woodcarving (Figure 14b, see also Orliac & Orliac 2008:205-208) and painting (Figure 13b) prove that, in Rapanui aesthetics, the eyes of marine birds were depicted with a black pupil and white iris outline. Looking further in the corpus of classical Rapanui woodcarvings, it becomes clear that the bone-and-obsidian eye design was used for all types of figurines – *moai kavakava*, *moai pa'apa'a*, *moai tangata*, *moai tangata moko*, *reimiro*, *ua*, *'ao*, as well as in miscellaneous carvings (Esen-Baur & Forment 1990). Therefore, it is tempting to suggest the existence of *generalized* iconographic conventions in Rapanui art that were applied both to woodcarving and painting. Extending these parallels,

one should note that the favorite wood for carving was red-colored *toromiro* and *mako'i* (Orliac & Orliac 2008:263-266), which is essentially replicated in painting with the majority of objects depicted in red, with black eyes outlined in white (Figure 13).

The most surprising result extracted from the computerized color enhancement of historic images of Ana Kai Tangata, is, of course, the large number of sailing vessels. There are at least five clear depictions of ships (Figure 12, #1, #3, #4, #5, and #7). The eroded traces suggest three more ships might be present (Figure 12, #2, #6 and #8). European ship #1, located under the horizontal bird "d", was first discussed by Routledge. In her depiction, it had two masts and a group of short vertical segments on top of its hull, seemingly representing sailors. Another ship might have been depicted under bird "c" (Figure 12, #2), judging by the conspicuous red cross-like shapes that look much like a conventionalized depiction of the masts of a European ship. There is a faint horizontal band passing under bird "c" (Figure 2), which may be a half-eroded trace of the ship's hull. A pronounced weathering of these details in Routledge's photograph (Figure 3), as well as the faint traces of ship #1, suggest that these vessels may be older than the depictions of birds "b", "c" and "d". If this is true, the painting has a certain compositional uniformity with birds "c" and "d" depicted on top of the ships. As ship #2 was painted lower, it provided enough space to accommodate bird "c" vertically. However, there was no place for a bird of the same size on top of ship #1 (taking into account that bird "a" was already there), so it was logical to paint bird "d" sideways.

Ships #3 – #6 are definitely more recent – their outlines are sharp and clear in historic photographs (Figures 2 and 3); their colors were still vibrant in the 1930s, as can be seen in Lavachery's watercolors (Figure 6). The sailing craft #3 is curved; its hull is marked with red outline and thick white transverse "stitches" – the features more indicative of a *pora* sailing raft or a Polynesian canoe rather than a European ship. As clearly seen from Kofoid's photograph (Figure 2), this sailing vessel had a white field above it merging with the white background of birds "r", "s", and "t", suggesting a possible contemporaneity of these designs. The 1905 photograph also shows the faint traces of a ship outline extending much to the right, implying that the original design might have been wider. The sailing vessel #4 is definitely European, with a cross-like mast and a faint outline of a square sail (Figure 3). This ship survived into the 1930s (Figure 6). The multi-mast European vessel #5 has a trapezoid-shaped white sail that was clearly seen in 1905 (Figure 2) and partially lost to exfoliation ten years later (Figure 3). At the time of Lavachery's visit, the design was even more eroded, but the red hull and perhaps a part of white sail were still visible (Figure 6). A red stripe just below it may possibly represent a hull of yet another ship, #6 (Figure 12). A small masted ship #7 painted in red with a thick white outline was clearly visible in 1905 (Figure 2). Routledge's photograph shows faint contours of what might be yet another vessel, ship #8, to the right of a boy's head (Figure 3). As Lavachery used bluish hues in this part of his watercolor, we tentatively suggest that the motif was possibly painted in black. The presence of so many sailing ships in the mural at Ana Kai Tangata provides a unique opportunity to understand the impact of European visitors on Rapanui culture in the early contact period.

Historic Ships in Rapanui Art

The early European visitors to Polynesia made a profound impression on the islanders, and this is evidenced by the appearance of their ships in the rock art of many islands, including Hawai'i:

> "The ship, a vehicle for transportation, the conveyance of power and the bringing to the island of new technology undoubtedly possessed *mana* in the eyes of the islanders; it was a 'floating island.' A petroglyph of a sailing vessel or gun ship may have been an effort to simply make a record or perhaps to tap into its power. But probably there was much more significance than that. The impact of Cook's arrival by ship with sails reminiscent of the tapa hung from a wooden cross, symbol of the god Lono, could and probably did carry on and became perpetuated in ways that would be consistent with the veneration Hawaiians held for the *ali'i*. Recalling the many women who directed their men folk to place *piko* stumps into cracks and crevices of Cook's ships, it is clear that Hawaiians believed the *mana* of a man-god could be extended to his possessions. A ship, under certain conditions, could be seen as holy tabernacle. Thus a sailing vessel was a suitable object for the petroglyph, fulfilling one of its most sacred functions: to succor and gain the favor of gods" (Lee & Stasack 1999:66).

On Easter Island, the depictions of historic ships once adorned the house interiors in the village of 'Orongo (Englert 1948:182-188; Ferdon 1961:236-240; Geiseler 1883, cited in Ayres & Ayres 1995:38-44; Palmer 1870:176; Routledge 1920:432-445; Thomson 1891:481). Alas, the majority of 'Orongo paintings have not been preserved. Yet, the clear depiction of at least eight ships are known from the literature, five of which have clear house attribution (Horley & Lee 2009: Figure 12). Several more ships were described in the surveys of 'Orongo Village without any accompanying illustrations. This suggests that there were about a dozen ship paintings in the birdman village.

Katherine Routledge published two watercolors (reproduced in black and white) of painted slabs decorating house interiors (Routledge 1919:Figure 105; Routledge 1920:Plate IV). We were able to locate her original paintings in the collections of the Royal Geographical Society, and provide them here in full color for the first time (Figure 15). A variant of one watercolor (Figure 15a) was published in Routledge's survey of 'Orongo with the description of a "three-masted ship, black on white ground, with two small figures in the rigging, one of them wearing a red shirt" (Routledge 1920:433). The color image clearly reveals a sailor in a red shirt. There may also be the suggestion of a second sailor depicted on top of the mast to the left. The painting of a bird with a long neck (Figure 15b) could not be successfully identified with bird species common to Rapa Nui (Jaramillo et al. 2008:13-14). In full accordance with Easter Island aesthetics, the bird was depicted in red with a white background. It seems, however, that the mural was considerably eroded at the time of documentation, so that the red paint was worn out from the lower part of the slab, exposing the gray rock surface. The paintings of historic ships, clearly identifiable with their square rigging, appear in two watercolors (Figure 15c, d), both painted in red. The handwritten notes below each picture make attribution of the paintings to a particular house possible in the numbering system used by Routledge (1920:Figure 2). The caption of Figure 15 cites the corresponding house numbers in Ferdon's enhanced system (see Horley & Lee 2009:118-119).

Surprisingly, only a few depictions of historic ships are known outside of 'Orongo, in both petroglyphs and paintings. The most explicit, perhaps, are the incised designs on a vertical panel at Ana Hanga Tu'u Hata located by the sea on the Hotu Iti plains (Figure 16a), which has attracted considerable research interest (Barthel 1962:112; Lee 1992:112-113; Pollard et al. 2010:571). The upper vessel is crescent-shaped with several *komari* symbols carved on its hull; it has a single mast with an apex-up triangular sail, which is somewhat confusing because "the Polynesian sails were simple and boomed lateens, *apex-down triangular sails* [emphasis ours] on small canoes, and claw-shaped sails" (Lewis 1994:62). The bottom ship, beyond any doubt, depicts an historic three-masted ship with a square rigging. Another naturalistic depiction of a European ship was documented by the Norwegian Archaeological Expedition in a cave located nearby at Vaihu:

> "The best preserved motif is a European sailing ship … The outline of the hull as well as the bowsprit are painted in red ochre surrounded by a finer line in bluish-black. The masts and the outlines of the sails are also bluish-black, and the sails have originally been filled in with red, most of which has come off. A small vessel further inside the cave … painted with white contours and without masts, is obviously meant to represent a European life-boat or landing barge" (Heyerdahl 1961:478-479).

The remainder of the documented ship depictions represent "curious hybrids, displaying features of both European ships and Polynesian canoes" (Pollard et al. 2010:570). An example is a ship petroglyph adorning the chest of the *moai* RR-049, as inventoried in the Atlas Arqueológico by Cristino et al. in 1981 (statue #263 in Englert's numbering system). The hull of the ship is clearly crescent-shaped, reminiscent a Polynesian canoe, yet there are three masts with distinctive square sails (Figure 16b). The *moai* with a ship incised on its chest is one of the vivid examples of reusing once-sacred objects during the later periods of Easter Island history (Lee 1992:122-126). A similar phenomenon can be seen in a crypt that was constructed below the toppled statues of Ahu Vinapu I. One of these *moai* (with survey number 2-210) has a painting of a white crescent with a red rectangle on its flank (Figure 16c). The watercolor made by John Linton Palmer in 1868 documents a white anthropomorph standing on top of this crescent (Van Tilburg 2006:34, Figure 54), suggesting that the shape actually represents a ship. Lavachery (1939:Figure 423) made a sketch of this design without realizing what it actually depicted. He went on further by proposing a tentative reconstruction of a standing *moai* with two symmetrical *vertical* white crescents painted over its body (Lavachery 1939:Figure 424), and expanded the crescent shapes so that they almost touch at the front of the statue. The result surprised Lavachery himself (1939:109): "I am not aware about [any] related documents for body painting of the Polynesians that could be compared to [the reconstructed *moai* painting shown in] Figure 424" – which is completely true because these motifs were not painted over a standing image, but rather over the crypt's ceiling formed by a toppled statue (Lee 1992:191).

We also recorded curious instances when the classic canoe petroglyphs – which are prominent on the north coast (Lee 1992:107) – were "updated" by the addition of square sails characteristic to European ships (Figure 16d). The original sails used in this part of Polynesia were claw-shaped (Lewis 1994:64). The depiction of a sail as "soaring" about the canoe without any mast can be tentatively explained because "in eastern Polynesia (Hawaii, Tahiti, Marquesas, etc.) such sails were mastless (i.e., one of its yards doubled as mast)" (Oliver 1989:381). In addition to the examples illustrated above, there are a number of rough crescent-shaped ship petroglyphs carved on red scoria objects such as slabs facing *ahu* walls or topknots, or *pukao* (Lee 1992:122-126; Van Tilburg & Lee 1987:142-147).

It is necessary to emphasize that the cultural impact of early European visitors might have been more profound than was previously thought. Several recent publications (see, e.g., Fischer 2005:53-56; Hunt & Lipo 2009:612; McCall 1990:166-168; Mulrooney et al. 2009:105; Pollard et al. 2010:567-569) present an extended discussion on this point. Indeed, the overwhelming display of firearms, trading of goods entirely new to the islanders, as well as large-scale ritual actions such as the placement of three crosses on the Poike Peninsula by the 1770 González Expedition, accompanied by a cannonade from the ships, might have been the factors "with the capacity to elicit cosmogonic crisis. The sheer isolation of Rapa Nui may have amplified the impact" (Pollard et al. 2010:568). The magnitude of this influence was strong enough to create an entirely new type of ceremonial architecture – *miro o'one*:

> "The simplest form of this celebration took place on long mounds of earth known as "miro-o-orne," [sic] or earth-ships, of which there are several in the island, one of them with a small mound near it to represent a boat. Here the natives used to gather together and act the part of a European crew, one taking the lead and giving orders to the others … In other cases, two, or perhaps three, boats were constructed inside the [large ceremonial] house … these boats were manned with crews clad in the garments of European sailors, the gifts from passing vessels being kept as stage properties." (Routledge 1919:239-240).

Recent excavations of a large *miro o'one* site by Charles Love (Figure 16e) revealed sensational data – the earth ship was constructed with an astonishing level of detail, reproducing construction techniques used in the visiting ships and was probably painted to a large extent to amplify the visual impact (Love 2012).

Therefore, returning to the realistic historical ship depictions in Rapa Nui rock art, one has to admit that the *highest* number of ship paintings were to be found at 'Orongo: "the slabs lining the wall, which are just opposite the doorway, and thus obtain a little light, are frequently painted; some of them have bird and others native designs, but perhaps the most popular is a European ship, sometimes in full sail" (Routledge 1919:256). In a previous paper, we suggested that the spectacular location of the sacred birdman village on the top of Rano Kau offered its inhabitants a nearly perfect 360° view of the ocean around the entire island, providing the best locale to spot approaching ships well in advance of anyone else on the island (Horley & Lee 2009:121, 123).

In this light, the discovery of essentially the same motif pattern of birds and ships (including realistic depictions of undoubtedly European vessels) in Ana Kai Tangata is thought-provoking. With only a dozen ship paintings documented from the more than forty houses of 'Orongo, the eight ships painted over a single wall of Ana Kai Tangata represent a particularly rich concentration of this motif. The pronounced association of birds with ships at both Ana Kai Tangata and 'Orongo confirms a strong connection between the sites, and, on the other hand, suggests that during a certain period of Easter Island history, there was a connection between 'Orongo ceremonies, birds, and European ships – at least, on an iconographic level.

To analyze this situation, let us first focus on migratory birds, which occupied a special place in the Polynesian universe:

> "Polynesian deities were believed to inhabit the sky, appearing as birds. Priests in the Society Islands received messages from the supernatural world through the cries of birds …. Birds were considered the vehicles for spirits in Hawai'i, and those Polynesians also had a god who was associated with eggs and birds …. Polynesian legends describe the god Tangaroa's creation as a bird emerging from a cosmic egg" (Lee 1992:22).

As migratory birds were seen as the messengers from the other world having the power to arrive to the island and to return to the mythical land of Hiva, it is possible that the first European visitors, also capable of arriving on and leaving the island, could have been considered as messengers from Hiva as well. Surprisingly, there are even more similarities in the migratory nature of birds and early visitors.

The detailed timeline of historical visits to Easter Island was meticulously compiled by Grant McCall (1990:179-199), showing that Easter Island became a popular destination in the 19th century, with over a hundred visiting ships between A.D. 1722-1862 (McCall 1990:173). By A.D. 1900, the number of documented ship calls rose to 231 (McCall 1990:173). It is feasible to assume that the paintings in Ana Kai Tangata were made during the period of A.D. 1722–1866/7, that is, before the last birdman competition was carried out (Routledge 1919:265). The years A.D. 1862-1863 mark the arrival of Peruvian slave traders that had a devastating impact on the Rapanui people. The toppling of the last statue, *moai* Paro, also occurred between 1862-64 (Fischer 2005:80; Thomson 1891:489). Therefore, we chose to study the seasonal distributions of ships calling up to the year 1870 (Figure 17).

The working hypothesis was that the predominantly "casual visits" (e.g., ships calling on Easter Island for trading or replenishing supplies rather than ships aiming

to reach the island by a certain date) should produce a pattern reflecting navigation conditions connected with seasonal climatic changes in the region. To avoid biased statistics, the twenty-two calls corresponding to Peruvian raids of 1862-63 were not included. In total, we analyzed the calling dates for 104 ships, which is lower than the total number reported by McCall for the period A.D. 1722-1870. The difference is due to the visits that do not have any calling date recorded (Figure 17).

As one can see from the figure, the visits of historic ships to Easter Island were pronouncedly seasonal, falling into two marked periods: one in March and the second in July-September (Figure 17). The latter period – the beginning of the Austral spring – had an enormous cultural importance on Rapa Nui, being the time of the birdman competition:

> "…in July, probably until the end of the month, groups gathered at Mataveri and Orongo and performed the first ceremonies to procure the favor of the gods in the race. In August the *hopu* went to Motu-nui and stayed there awaiting the coming of the first *manu-tara*. In September the first eggs were found, the bird-man of the year selected, and great feasts held at Orongo" (Métraux 1940:340).

The Austral autumn starts in March – a half a year after the birdman competition – coinciding with the second "wave" of possible arrivals of the visiting ships. September and March by themselves were extremely important from an astronomical point of view as the months including the spring and autumn equinoxes. Therefore, it is tempting to speculate that the coincidence of European visits with the important cultural periods of the Rapanui calendar might have increased the cultural impact of such visits. The tentative observer's formula that "the ships usually come in the bird season or half a year after birds' arrival" might have formed certain connections in a new Rapanui cosmology, which became reflected in the paintings of ʻOrongo and Ana Kai Tangata as a strong association of migratory birds with (not less migratory) ships.

Conclusions

The reanalysis of a range of images has shown that the paintings of Ana Kai Tangata cave originally presented about two dozen bird motifs and numerous depictions of European ships. Comparative analysis of bird images, based on the degree of erosion and painting style, allow the development of a tentative sequence in which these designs were painted, possibly starting from the ceiling of the dome of the cave. A study of historical documents revealed that several bird images originally had black eyes outlined with white, perfectly matching the iconography of sooty tern depictions in ʻOrongo as well as stylistic conventions used in Rapanui woodcarving. A direct and prominent association of bird designs with historic ships may parallel the arrival of migratory birds to Easter Island and the later departure for Hiva; the visiting ships essentially performed the same actions at the same time. The chronology of ship callings reveals a seasonality with peaks in March and July-September, the months that have high cultural importance in the ancient Rapanui calendar; it may be that this seasonality was yet another characteristic that allowed for a close association between ship and bird designs in the ʻOrongo and Ana Kai Tangata paintings.

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